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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,517	12/05/2003	Sang-Yong Kim	8836-203 (IE12204-US)	9036
22150	7590	03/28/2006	EXAMINER	
F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797			THOMAS, TONIAE M	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 03/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/728,517	KIM ET AL.	
	Examiner Toniae M. Thomas	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 09 January 2006.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-6, 11-34, 39 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) 11-34 and 39 is/are allowed.  
 6) Claim(s) 1,2 and 4 is/are rejected.  
 7) Claim(s) 3,5 and 6 is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 05 December 2003 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_

4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_

5) Notice of Informal Patent Application (PTO-152)  
 6) Other: \_\_\_\_\_

**DETAILED ACTION**

1. This Office action is responsive to the amendment filed on 09 January 2006.
2. The amendment filed on 09 January 2006 canceled claims 7-10 and 35-38, and added claim 39. Accordingly, claims 1-6, 11-34, and 39 are pending.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. *Claims 1, 2, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 2002/0180055 A1).*

The Takahashi et al. application publication (Takahashi) discloses a method of selectively removing metal layers in a process for fabricating a semiconductor device (see figs. 3-7 and accompanying text). The method comprises: removing the metal layers with a cleaning solution, the cleaning solution comprising an acid solution and an etchant containing iodine, as recited in claim 1 (see par. 0132).

The metal layers comprise at least a titanium layer, as recited in claim 2 (see par. 0132).

The acid solution includes phosphoric acid, as recited in claim 4 (see par. 0132).

Takahashi does not teach that the iodine-containing etchant is an oxidization agent selected from the group consisting of  $\text{NH}_4\text{IO}_3$ ,  $\text{LiIO}_3$ ,  $\text{CaIO}_3$ ,  $\text{BaIO}_3$ ,  $\text{KI}$ , and  $\text{NH}_4\text{I}$ . However,  $\text{NH}_4\text{IO}_3$ ,  $\text{LiIO}_3$ ,  $\text{CaIO}_3$ ,  $\text{BaIO}_3$ ,  $\text{KI}$ , and  $\text{NH}_4\text{I}$  are iodine-containing etchants. Therefore, using for the iodine-containing etchant an oxidizing agent selected from the group consisting of  $\text{NH}_4\text{IO}_3$ ,  $\text{LiIO}_3$ ,  $\text{CaIO}_3$ ,  $\text{BaIO}_3$ ,  $\text{KI}$ , and  $\text{NH}_4\text{I}$  is taken to be obvious over Takahashi.

4. *Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwag et al. (US 6,140,233) in view of Ma et al. (US 2003/0047539 A1).*

The Kwag et al. patent (Kwag) discloses a method of selectively removing metal layers in a process for fabricating a semiconductor device (see figs. 10-15 and accompanying text). The method comprises: removing tungsten layer 232 with a cleaning solution (col. 9, lines 25-34, wherein the cleaning solution may comprise an acid solution and an oxidation agent containing iodine, and wherein  $\text{KIO}_3$  can be used as the oxidation agent (col. 8, lines 35-40).

The acid solution may include at least one of sulfuric acid and phosphoric acid, as recited in claim 4 (col. 8, lines 35-40).

While Kwag discloses using  $\text{KIO}_3$  as the oxidizing agent, Kwag does not disclose that the oxidation agent may include at least one selected from the group consisting of  $\text{KIO}_3$ ,  $\text{NH}_4\text{IO}_3$ ,  $\text{LiIO}_3$ ,  $\text{CaIO}_3$ ,  $\text{BaIO}_3$ ,  $\text{KI}$ , and  $\text{NH}_4\text{I}$ . However,

the Ma et al. application publication (Ma) teaches that NH<sub>4</sub>IO<sub>3</sub> can be used as an oxidizing agent in place of KIO<sub>3</sub> (see par. 0054, lines 1-7).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Kwag by using NH<sub>4</sub>IO<sub>3</sub> for the oxidation agent, because NH<sub>4</sub>IO<sub>3</sub> is an alternate oxidation agent that can be used in place of KIO<sub>3</sub>.

#### ***Allowable Subject Matter***

5. Claims 11-34 and 39 are allowable over the prior art of record. The prior art of record does not anticipate, teach, or suggest a method of selectively removing a metal layer in a process for forming a silicide layer substantially as recited in claim 11, wherein the method comprises: cleaning a non-reacting metal layer that does not participate in the silicidation reaction using a cleaning solution, wherein the cleaning solution includes an acid solution and an oxidation agent containing iodine. In addition, the prior art of record does not anticipate, teach, or suggest a method of selectively removing a metal layer in a process for forming a silicide layer substantially as recited in claim 25, wherein the method comprises: performing a cleaning that removes the titanium nitride layer and a non-reacting metal layer using a cleaning solution, wherein the cleaning solution includes an acid solution, an oxidation agent containing iodine, and water. Moreover, the prior art of record does not anticipate, teach, or suggest a method of selectively removing a metal layer in a process for fabricating a semiconductor device substantially as recited in claim

39, wherein the cleaning solution used to remove the metal layers comprises an acid solution, an oxidizing agent containing iodine, and water.

6. Claims 3, 5, and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

7. Applicant's arguments with respect to claims 1, 2, and 4 have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

8. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

9. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TMT  
15 March 2006



Mary Wilczewski  
Primary Examiner